

Five new species of *Fusinus* (Gastropoda: Fascioliidae) from western Pacific and Arafura Sea

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KEYWORDS. Fascioliidae, *Fusinus*, *Chryseofusus*, Indo-West Pacific, new taxa.

ABSTRACT. A number of *Fusinus* species from Indo-West Pacific deep water are studied. Five new species are added to this fauna: *F. inglorius* sp. nov. (Taiwan, off Tashi, 506-680 m), *F. flavicomus* sp. nov. (Taiwan, off Tashi, 145-200 m), *F. wallacei* sp. nov. (Indonesia, Tanimbar Islands, 356-368 m), *F. alcyoneum* sp. nov. (southern New Caledonia, 513 m) and *F. thermariensis* sp. nov. (Volcans Hunter and Matthew, 325-400 m). Four species are known by only one specimen each and are recorded as separate species but not described as new.

INTRODUCTION

An ongoing sampling program to study the tropical deep-sea benthos in the Indo Pacific, for a better knowledge of the biodiversity, resulted in the discovery of a multitude of interesting and new species. The Fascioliidae are found to be well-represented in this material. Hadorn and Fraussen (2003) presented the results on a group of deep-water (mainly bathyal) *Fusinus* species from the Indo-West Pacific by describing the subgenus *Chryseofusus* including several new species. In a second paper Hadorn and Fraussen (2005) presented a revision of the genus *Granulifusus* by listing and comparing the known Recent and fossil species and by describing a number of new Recent and one fossil species. In the present paper we continue this work by describing 5 additional new *Fusinus* species collected by the French expeditions, conducted by MNHN, IRD (previously ORSTOM), NMNS and LIPI.

MATERIAL AND METHODS

The material reported on in the present study originates from:

- (a) TAIWAN 2000 and TAIWAN 2001 expeditions conducted by MNHN and NMNS;
- (b) KARUBAR expedition to Indonesia conducted in 1991 by MNHN and LIPI;
- (c) MUSORSTOM 2 expedition to the Philippine Islands conducted by MNHN and (ORSTOM) IRD;
- (d) MUSORSTOM 5, MUSORSTOM 6, MUSORSTOM 7, MUSORSTOM 8, MUSORSTOM 10, CHALCAL 2, HALICAL 1, BATHUS 2, BATHUS 3, BIOCAL, BIOGEOCAL, SMIB 3, SMIB

4, SMIB 8, SMIB 10, NORFOLK 1 and VOLSMAR expeditions to the seas around New Caledonia (Coral Sea, Fiji Basin, Lau Basin, Loyalty Basin, South Pacific) conducted by MNHN and (ORSTOM) IRD. Material from these expeditions is, unless stated otherwise, deposited in MNHN. The method of Verduin (1977) was used to count the number of protoconch whorls.

Abbreviations

IRD: Institut Français de Recherche Scientifique pour le Développement en Coopération, Nouméa, New Caledonia
KF: Collection Koen Fraussen, Aarschot, Belgium
LIPI: Pusat Penelitian Biologi, LIPI, Indonesia
MNHN: Muséum national d'Histoire naturelle, Paris, France
MZB: Museum of Zoology, Bogor, *Museum Zoologicum Bogoriense*, Pusat Penelitian Biologi, LIPI, Indonesia
NMNS: National Museum of Natural Science, Taichung, Taiwan
ORSTOM: former name for IRD
RH: Collection Roland Hadorn, Lyss, Switzerland
SMNH: Swedish Museum of Natural History, Stockholm, Sweden
CC: (chalut à crevettes) shrimp trawl
CH: (chalut) trawl
CP: (chalut à perche) beam trawl
DW: (drague Warén) Warén dredge
dd: dead collected specimen
juv: juvenile specimen
lv: live collected specimen
subad: subadult specimen

SYSTEMATICS

Family FASCIOLARIIDAE Gray, 1853

Subfamily FUSININAE Wrigley, 1927

Genus *Fusinus* Rafinesque, 1815

Type species: *Murex colus* Linnaeus, 1758; Recent, Indo-Pacific (by monotypy).

Fusinus inglorius sp. nov.

Figs 1-4, 31

Type material. Holotype NMNS-5111-001 (34.8 x 13.5 mm, lv).

Paratype 1, MNHN Moll 9402 (33.1 x 12.2 mm, lv). –

Paratype 2, RH (36.5 x 13.5 mm, lv). – Paratype 3, KF (31.5 x 11.5 mm, lv).

Type locality. Taiwan, northeast coast, off Tashi, TAIWAN 2001 stn CP99, 24°53.2' N, 122°04.0' E, 506-680 m.

Material examined. Taiwan, Bashi channel, TAIWAN 2000 stn CP38, 21°32.1' N, 120°48.1' E, 1314-1317 m, 1 dd juv. – East coast, stn CP55, 24°26.9' N, 122°18.1' E, 638 m, 1 lv juv; stn DW56, 24°29.8' N, 122°12.6' E, 438 m, 1 dd juv. – Northeast coast, off Tashi, TAIWAN 2001 stn CP68, 24°49.6' N, 122°00.8' E, 370 m, 1 dd; stn CP71, 24°52.3' N, 122°03.1' E, 600 m, 2 lv; stn CP77, 24°54.2' N, 122°02.5' E, 360 m, 1 dd; stn CP88, 24°51.3' N, 122°02.8' E, 650 m, 3 lv/1 lv juv/2 dd; stn CP89, 24°53.6' N, 122°01.4' E, 310-420 m, 1 dd; stn CP96, 24°04.2' N, 122°04.2' E, 472-586 m, 1 lv/2 dd; stn CP99, 24°53.2' N, 122°04.0' E, 506-680 m, 5 lv/4 dd/1 dd juv (holotype and all paratypes); stn CP111, 24°52.2' N, 122°04.3' E, 540-700 m, 1 lv.

Description. Shell rather small for genus, up to 38.4 mm, fusiform, off-white, spire elongated, consisting of about 9 convex whorls including protoconch. Surface often rough, spire tip usually eroded. Suture distinct, constricted, wavy.

Protoconch bulbous, white, glossy, smooth, consisting of about one whorl. Transition to teleoconch and first teleoconch whorl eroded in most specimens. Last part with 4-6 conspicuously close-set irregular growth lines, transition indistinct. Diameter 0.8-1.0 mm.

Axial sculpture consisting of rather weak, narrow axial ribs, reaching from suture to suture on all

postnuclear whorls. Interspaces as broad as ribs. 8-10 axial ribs on 3 uppermost postnuclear whorls, 9-11 on following whorls, 11-14 on penultimate and body whorl. Axial ribs on body whorl occasionally weaker or absent.

Spiral sculpture rather fine, weak, inconspicuous. Teleoconch beginning with 4 primary spiral cords, 2 central cords more prominent. One secondary cord appears between primary cords from second postnuclear whorl on. From third whorl on fine tertiary cords appear on both sides of the secondary cords, increasing up to 4 on body whorl. Secondary cords occasionally becoming as strong as primary cords on later whorls.

Aperture ovate, white, pointed above. Parietal callus smooth, glossy, appressed to parietal wall, not detached. Occasionally with small simple adapical denticle. Columellar folds absent. Outer lip simple, smooth inside, edge slightly crenulated.

Siphonal canal short, usually as long as aperture, curved, widely open, slightly recurved.

Operculum typical of genus, corneous, light brown, ovate, rounded above, pointed below, filling aperture. Outer side with fine concentric growth lines.

Periostracum olive, rather thin, well-adherent.

Radula (Fig. 31) typical of genus. Central tooth rather large, tricuspid, with short broad cusps, base convex, broader than top, both sides slightly concave. Lateral teeth short, curved, with only 4 strong, broad, pointed cusps, outermost strongest. At inner side with tiny denticle.

Range and habitat. Only known from Taiwan. Live collected specimens 586-650 m deep, empty or crabbed shells 360-1314 m deep.

Comparison. *Fusinus bocagei bocagei* (P. Fischer, 1882) is similar in size and sculpture and has a rough surface, but differs by having fewer (about 8-10) but broader axial ribs on the body whorl, a two-whorled protoconch, and the radula with 5 or 6 cusps on the lateral teeth.

Fusinus retiarius (von Martens, 1901) also has a similar appearance (sculpture, the rough, often eroded surface), but differs by the larger adult size, the broader, heavier and thicker shell, the more pronounced and broader axial ribs which are lower in number on all whorls.

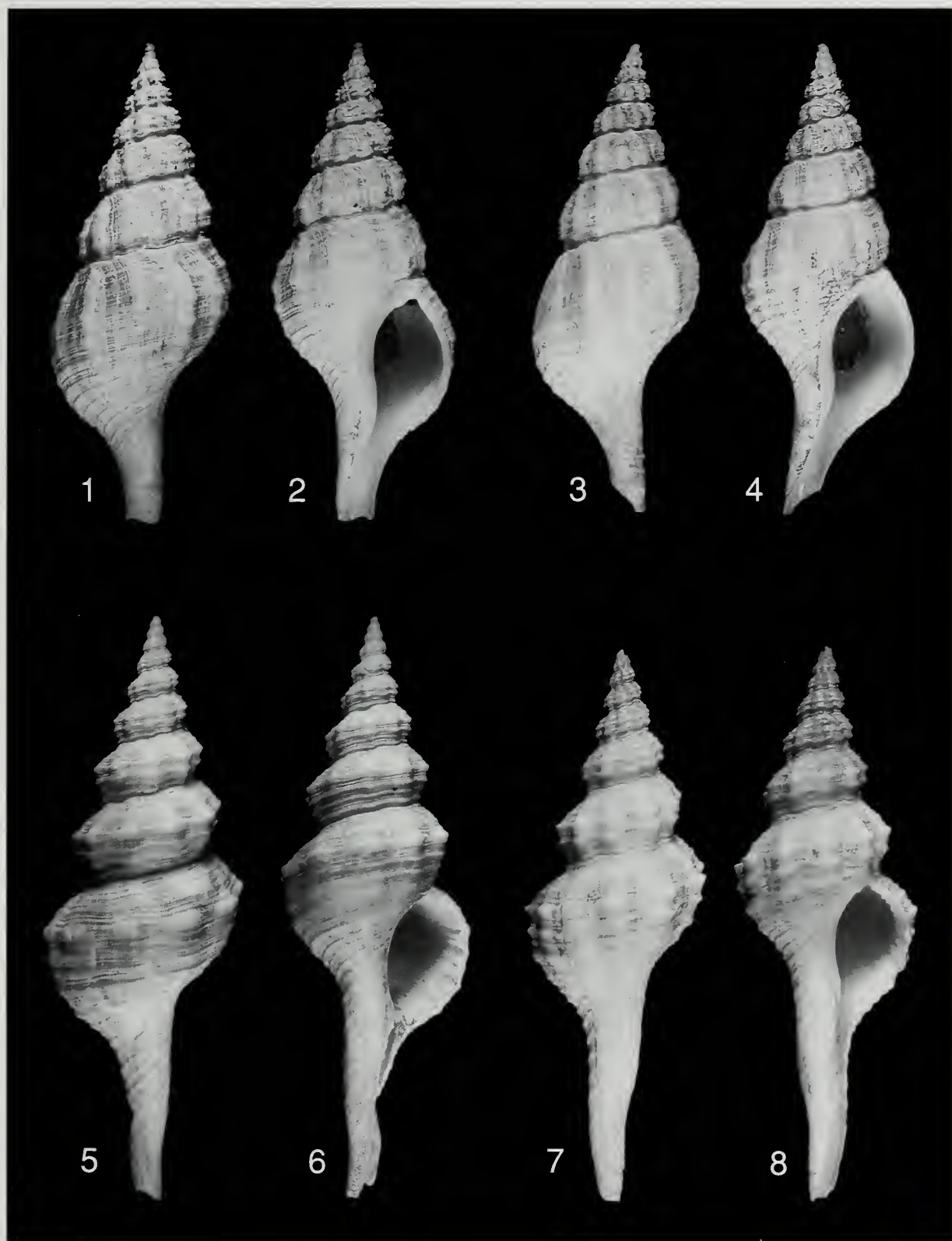
Figures 1-8

1-4. *Fusinus inglorius* sp. nov.

1-2. Holotype NMNS-5111-001, Taiwan, off Tashi, TAIWAN 2001 stn CP99, 34.8 mm; 3-4. Paratype 1 MNHN Moll 9402, Taiwan, off Tashi, TAIWAN 2001 stn CP99, 33.1 mm.

5-8. *Fusinus flavicomus* sp. nov.

5-6. Holotype NMNS-5110-001, Taiwan, off Tashi, TAIWAN 2001 stn CP79, 89.3 mm; 7-8. Paratype 1 MNHN Moll 9403, Taiwan, off Tashi, TAIWAN 2001 stn CP79, 57.4 mm.



Etymology. *Fusinus inglorius* sp. nov. is named after the Latin expression *inglorius* (adjective), also called *ingloriosus*, meaning "infamous", which refers to the white, rough surface of the shell. In this case the expression is not used in a negative way, as aesthetic appreciation is subjective and will not affect the natural and sober beauty of this species.

***Fusinus flavicomus* sp. nov.**

Figs 5-8, 32

Type material. Holotype NMNS-5110-001 (89.3 x 29.8 mm, dd).

Paratype 1, MNHN Moll 9403 (57.4 x 18.9 mm, lv subad). – Paratype 2, RH (92.3 x 30.1 mm, dd). – Paratype 3, KF (64.9 x 23.5 mm, dd).

Type locality. Taiwan, northeast coast, off Tashi, TAIWAN 2001 stn CP79, 24°50.4' N, 121°59.9' E, 145-200 m.

Material examined. Taiwan, northeast coast, off Tashi, TAIWAN 2001 stn CP79, 24°50.4' N, 121°59.9' E, 145-200 m, 5 dd/3 lv subad/1 lv juv (holotype and all paratypes); stn CP94, 24°53.4' N, 121°58.0' E, 153 m, 1 dd juv.

Description. Shell relatively large (64.9-92.3 mm), fusiform, solid, spire long, consisting of 9 or 10 distinctly carinated postnuclear whorls. Suture distinct, constricted. Shoulder slope straight or slightly convex, peripheral keel distinct with strong, rounded, vertically compressed knobs. Siphonal canal long. Colour cream to light orange, stronger spiral cords and threads slightly reddish brown tinged, 2 central cords darker.

Protoconch white, becoming pale brownish on second whorl, bulbous, smooth and glossy, consisting of 1 ½-1 ¾ whorls. Transition to the teleoconch abrupt, eroded, presumably with 1 or 2 weak axial riblets. Diameter about 1.3 mm.

Axial ribs rather strong on upper whorls, reaching from suture to suture. On penultimate or body whorl becoming weaker, pointed, withdrawing from upper suture. 9-11, occasionally 8, axial ribs on upper whorls, 9-13 on penultimate and body whorl.

Teleoconch beginning with 3 primary spiral cords, 2 abapical ones clearly stronger. Next 1 or 2 whorls with 2 additional primary cords appearing: one strong cord above lower suture, one weak on upper suture. 2

peripheral cords stronger, resulting in upper whorls with a bicarinate profile. Central cord becoming strongest on penultimate whorl, forming an unicarinate profile. One fine intercalated secondary spiral cord appearing between each pair of primary spiral cords from second postnuclear whorl onwards. From third whorl on, one fine tertiary cord appearing on both sides of secondary cords, becoming as strong as secondary ones on body whorl. Occasionally the number of tertiary cords increasing up to 3 on last whorl. Stronger cords becoming broader and more prominent when crossing axial ribs.

Aperture rather large, ovate, pinched at both ends. Outer lip convex, thickened, edge slightly crenulated. White inside, with 25-30 fine but distinct lirae. Inner lip smooth, attached to parietal wall. On upper end some underlying spiral cords visible. Columellar folds absent. Siphonal canal long, broad, slightly twisted, tapering anteriorly. Outer side ornamented with stronger cords and intercalated finer threads, becoming weaker towards tip of siphonal canal.

Periostracum brownish, rather thick.

Operculum corneous, dark brown, ovate, rounded above, pointed below, nucleus terminal.

Radula (Fig. 32) typical of genus, central tooth small, base broad and straight, top narrow, both sides concave, with 3 strong, long, narrow cusps and 1 tiny fourth pointed cusp. Lateral teeth long, slightly curved, with 9 short, pointed cusps, the central cusps a little bit smaller and weaker. At both ends with a small denticle.

Range and habitat. At present only known from the northeast coast of Taiwan, off Tashi, living 145-200 m deep.

Comparison. *Fusinus beckii* (Reeve, 1848) differs by the entire white shell, the larger size, the longer and narrower siphonal canal, and the finer spiral sculpture. *Fusinus nicobaricus* (Röding, 1798) is most similar in shape and sculpture, but differs by the vivid reddish brown to brown markings on all whorls, the larger shell size, the more pronounced carina with sharp pointed cusps, the concave shoulder slope, the broader and stronger siphonal canal, and the prominent broad spiral cords on the siphonal canal.

Fusinus laticostatus (Deshayes, 1830) differs by the same characteristics as *F. nicobaricus* and by being smooth.

Figures 9-18

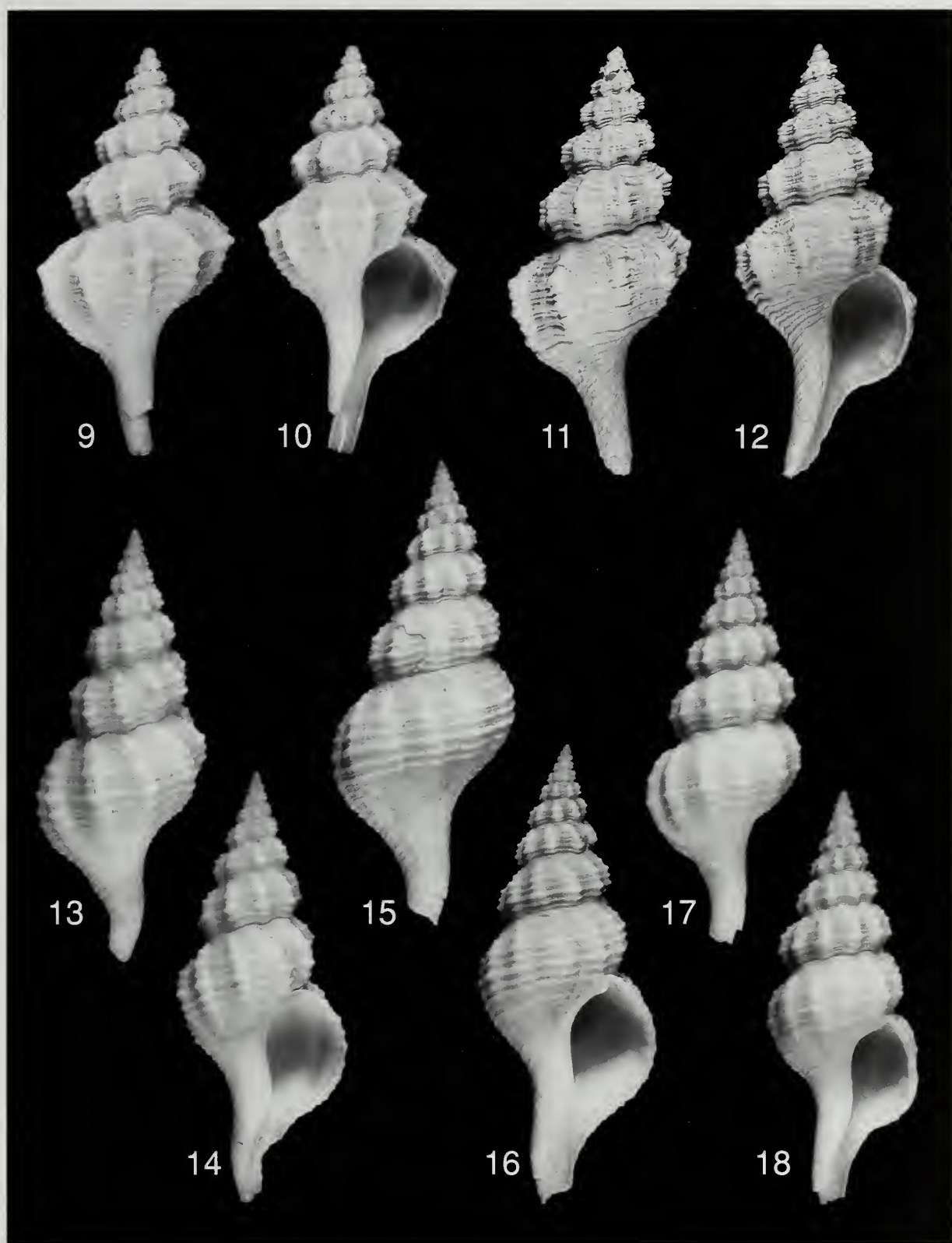
9-12. *Fusinus wallacei* sp. nov.

9-10. Holotype MNHN Moll 9404, Indonesia, Tanimbar Islands, KARUBAR stn CP69, 27.0 mm;

11-12. Paratype 1 MNHN Moll 9405, Indonesia, Tanimbar Islands, KARUBAR stn CP69, 27.1 mm.

13-18. *Fusinus aleyoneum* sp. nov.

13-14. Holotype MNHN Moll 9406, south New Caledonia, SMIB 3 stn DW3, 37.3 mm; 15-16. New Caledonia, Norfolk Ridge, Banc Introuvable, NORFOLK 1 stn DW1699, MNHN, 46.3 mm; 17-18. Fiji, Bligh Water, MUSORSTOM 10 stn CC1336, MNHN, 40.7 mm.



Fusinus tuberosus tuberosus (Reeve, 1847) differs by the smaller shell size, the broader spire angle, the more pronounced knobby carina, the larger aperture, and the shorter siphonal canal.

Fusinus tuberosus sagamiensis (Kuroda and Habe, 1971) can be distinguished by the larger shell size, the larger number of axial ribs with narrower interspaces, the reddish brown interspaces and the brownish shoulder slope, the weaker spiral sculpture, and by the comparatively longer siphonal canal.

Fusinus michaelrogersi Goodwin, 2001 differs by the larger, heavier and uniform white shell, the broad, large and prominent knobs, the less constricted suture, the larger aperture, and the broad siphonal canal.

Fusinus tuberculatus (Lamarck, 1822) differs by a larger shell, a longer spire, the reddish brown interspaces between the axial ribs, the larger aperture, and in having the inner apertural lip detached from the parietal wall.

Fusinus polygonoides (Lamarck, 1822) differs by the smaller shell size, the more prominent axial ribs, and the shorter and broader siphonal canal.

Fusinus perplexus (A. Adams, 1864) was redescribed by Callomon and Snyder (2004: 14-18) and many forms of this variable species were figured. *F. perplexus* differs by the larger adult size (90-170 mm, average 138.2 mm), the smaller protoconch (approximately 0.7 mm in diameter), the larger number of axial ribs (11-14 per whorl on upper whorls), and the less prominent carina (if present) on later whorls.

Fusinus ferrugineus (Kuroda and Habe, 1960) has about the same adult size but differs by the lighter and thinner shell, the usually more convex, rounded whorls, the weaker, less prominent carina at periphery, the sharper spiral sculpture, the weaker axial ribs and the larger number of axial ribs on all whorls.

Etymology. *Fusinus flavicomus* sp. nov. is named after the Latin expression *flavicomus* (adjective), also called *flavicomans*, meaning "with golden locks", which refers to the yellowish colour with some brownish pattern.

***Fusinus wallacei* sp. nov.**

Figs 9-12, 33

Type material. Holotype MNHN Moll 9404 (27.0 x 13.1 mm, lv).

Paratype 1, MNHN Moll 9405 (27.1 x 11.4 mm, dd).

– Paratype 2, MZB.Gst.13.322 (25.4 x 11.7 mm, dd).

– Paratype 3, RH (23.6 x 10.3 mm, lv). – Paratype 4, KF (18.9 x 7.8 mm, dd subad).

Type locality. Indonesia, Tanimbar Islands, KARUBAR stn CP69, 08°42' S, 131°53' E, 356-368 m.

Material examined. Indonesia, Tanimbar Islands, KARUBAR stn CP46, 08°01' S, 132°51' E, 271-273

m, 1 dd subad (paratype KF); stn CP69, 08°42' S, 131°53' E, 356-368 m, 3 lv/5 dd (holotype and paratypes MNHN/MZB); stn CP77, 08°57' S, 131°27' E, 346-352 m, 1 lv (paratype RH).

Description. Shell small (22-28 mm), fusiform, spire angle broad (37° - 43°), consisting of 7 or 8 uniformly whitish, strongly convex, carinated whorls. Axial sculpture strong, well developed. Spiral cords well-visible, usually forming a distinct double keel at periphery. Shoulder slope slightly convex, suture deeply incised, wavy according to the axial sculpture. Growth lines well-visible on all whorls.

Protoconch relatively large, paucispiral, consisting of one bulbous whorl, always sloping towards coiling axis, whitish, smooth, transition to teleoconch sculptured with 1 or 2 strong axial riblets reaching from suture to suture, ending in a varix. Diameter: 1.0 mm.

7-9 axial ribs on upper whorls, 8-10 on penultimate and body whorl. Ribs narrow and prominent, crossing from suture to suture on all whorls, becoming sharp and pointed at periphery of lower whorls. Interspaces deeply impressed, wide, broader than ribs.

Teleoconch begins with 4 spiral cords; two middle ones stronger, usually forming a distinct, single or double keel, at periphery. From second or third postnuclear whorl onwards, a fine intercalated secondary cord appears between primary cords. A fine tertiary cord arises on both sides of the secondary cords on penultimate and/or body whorl. Spiral cords strongly developed, forming sharp pointed knobs at periphery, when crossing axial ribs.

Aperture round, white. Outer lip simple, finely crenulated, sculptured with some internal lirae, mainly on lower half of aperture. Parietal callus thin, smooth, appressed to parietal wall. Siphonal canal rather long, nearly straight, bending to the left and slightly backwards, tapered anteriorly. Outer side sculptured with rather weak spiral cords and intercalated fine threads.

Periostracum thin, olive coloured.

Operculum typical of genus, corneous, light brown, shape and size corresponding to aperture.

Radula (Fig. 33) typical of genus. Central tooth tricuspid, elongate, with 3 strong, pointed cusps, clearly projecting below the base. Middle cusp longest. Lateral teeth rather short, curved, base broad, with 6 short pointed cusps, with incurved tips, both ends with a small denticle.

Range and habitat. Only known from Indonesia, Tanimbar Islands, live collected specimens 352-356 m deep, empty or crabbed shells 273-356 m deep.

Comparison. *Fusinus wallacei* sp. nov. most closely resembles the strongly carinated deep-water form of *F. sanctaeluciae* (von Salis-Marschlins, 1793), a species restricted to the Mediterranean and Lusitanian province and differs in having a larger size, an often

reddish-brown colour, an often stronger peripheral keel (occasionally forming strong spines), a thicker parietal callus, and a longer siphonal canal.

Etymology. *Fusinus wallacei* sp. nov. is named after the famous naturalist Alfred Russel Wallace (1823-1913). He made great discoveries and many keen observations. He traveled through the Indonesian Islands from 1854 till 1862, crossing the southern waters which harbour the present new species. We had great joy reading his book "The Malay Archipelago" and have spent many pleasant hours discussing his explorations.

***Fusinus alcyoneum* sp. nov.**

Figs 13-18, 34

Type material. Holotype MNHN Moll 9406 (37.3 x 14.9 mm, dd).

Paratype 1, MNHN Moll 9407 (30.1 x 11.8 mm, dd juv). – Paratype 2, MNHN Moll 9408 (31.0 x 12.5 mm, dd juv). – Paratype 3, MNHN Moll 9409 (33.6 x 14.0 mm, dd). – Paratype 4, RH (37.1 x 15.2 mm, dd). – Paratype 5, KF (30.9 x 12.1 mm, lv juv).

Type locality. Southern New Caledonia, SMIB 3 stn DW3, 24°55' S, 168°22' E, 513 m.

Material examined. Coral Sea, Chesterfield, **MUSORSTOM 5** stn 355, 19°36' S, 158°43' E, 580 m, 1 lv.

New Caledonia, Grand Passage, **HALICAL 1** stn DW02, 18°54' S, 163°24' E, 352-397 m, 1 lv; stns 01-04, 18°53' S/18°56' S, 163°24' E, 350-400 m, 1 lv. – **BATHUS 2** stn DW721, 22°54' S, 167°17' E, 525-547 m, 2 dd; stn CP735, 23°02' S, 166°56' E, 530-570 m, 1 lv juv. – **SMIB 3** stn DW1, 24°56' S, 168°22' E, 520 m, 1 dd; stn DW2, 24°53' S, 168°22' E, 530-537 m, 1 lv juv; stn DW3, 24°55' S, 168°22' E, 513 m, 1 lv/5 dd (holotype and all paratypes); stn DW5, 24°55' S, 168°22' E, 502-512 m, 3 dd; stn DW6, 24°56' S, 168°21' E, 505 m, 1 dd; stn DW7, 24°55' S, 168°21' E, 505 m, 1 lv/2 dd/1 dd juv. – **SMIB 4** stn DW36, 24°56' S, 168°22' E, 500-530 m, 1 dd. – Eponge Bank, Mount B, **SMIB 8** stn DW146-147, 24°55' S, 168°22' E, 508-532 m, 3 dd/1 dd juv; stn DW149, 24°55' S, 168°22' E, 508-510 m, 1 dd; stn DW152, 24°54' S, 168°22' E, 514-530 m, 3 dd. – **SMIB 10** stn DW205, 24°57' S, 168°21' E, 517-559 m, 1 lv/1 dd; stn DW215, 24°56' S, 168°21' E, 508-553 m, 1 dd. – **BIOCAL** stn DW66, 24°55' S, 168°22' E, 505-515 m, 1 lv/2 dd juv. – **CHALCAL 2** stn CC1, 24°55' S, 168°22' E, 500 m, 1 dd; stn CC2, 24°55' S, 168°21' E, 500 m, 2 lv/1 dd; stn DW72, 24°55' S, 168°22' E, 527 m, 1 lv/1 lv juv/1 dd/2 dd juv; stn DW73, 24°40' S, 168°38' E, 573 m, 1 lv; stn DW74, 24°40' S, 168°38' E, 650 m, 1 dd/1 dd juv. – Loyalty Ridge, **BATHUS 3** stn DW776, 24°44' S, 170°08' E, 770-830 m, 1 lv juv/2 dd juv; stn DW781, 23°54' S, 169°46' E, 625-640 m, 2 lv/1 fragment; stn DW784, 23°56' S, 169°46' E, 611-615 m, 1 lv; stn DW785,

23°56' S, 169°46' E, 607-608 m, 1 lv; stn DW786, 23°54' S, 169°49' E, 699-715 m, 1 dd juv; stn CP788, 23°54' S, 169°50' E, 652-750 m, 1 dd juv; stn DW790, 23°49' S, 169°48' E, 685-715 m, 4 dd/1 dd juv; stn DW800, 23°35' S, 169°37' E, 655 m, 1 dd/1 lv juv. – Norfolk Ridge, stn DW824, 23°19' S, 168°00' E, 601-608 m, 1 lv; stn DW825, 23°22' S, 168°00' E, 597-605 m, 1 dd. – West Jumeau Bank, **NORFOLK 1** stn CP1670, 23°39' S, 167°59' E, 382-386 m, 1 dd. – Eponge Bank, stn DW1684, 24°55' S, 168°22' E, 508-541 m, 1 dd; stn CP1685, 24°57' S, 168°21' E, 509-564 m, 1 dd; stn CP1687, 24°54' S, 168°22' E, 539-545 m, 1 dd; stn DW1691, 24°54' S, 168°22' E, 509-513 m, 1 dd. – Introuvable Bank, stn DW1694, 24°40' S, 168°39' E, 575-589 m, 1 dd; stn DW1695, 24°40' S, 168°39' E, 562-587 m, 1 dd; stn DW1697, 24°39' S, 168°38' E, 569-616 m, 1 dd juv; stn DW1699, 24°40' S, 168°40' E, 581-600 m, 1 lv. – East Jumeau Bank, stn DW1707, 23°43' S, 168°16' E, 381-493 m, 2 dd. – Loyalty Ridge, **VOLSMAR** stn DW37, 22°23' S, 168°43' E, 500-550 m, 1 lv; stn DW43, 22°12' S, 168°38' E, 480-540 m, 1 lv juv. – **MUSORSTOM 6** stn DW468, 21°06' S, 167°33' E, 600 m, 2 lv juv.

Loyalty Basin, **BIOGEOCAL** stn DW308, 20°40' S, 166°58' E, 510-590 m, 1 dd.

Vanuatu, **MUSORSTOM 8** stn DW1128, 16°02' S, 166°38' E, 778-811 m, 1 dd.

Fiji, Bligh Water, **MUSORSTOM 10** stn CP1309, 17°32.0' S, 178°53.2' E, 843-887 m, 1 dd; stn CP1331, 17°02.4' S, 178°01.8' E, 694-703 m, 5 lv/1 dd; stn CP1332, 16°56.2' S, 178°07.9' E, 640-687 m, 1 lv; stn CC1336, 16°58.0' S, 177°58.4' E, 797-799 m, 3 lv/2 dd; stn CC1337, 17°03.4' S, 177°47.2' E, 635-670 m, 1 lv; stn CP1346, 17°19.6' S, 178°32.4' E, 673-683 m, 3 lv.

Description. Shell rather small for genus (45 mm, occasionally up to 50 mm), fusiform, stout, rather heavy, consisting of 11 or 12 convex whorls. Spire angle broad (39° - 42°). Suture constricted, wavy. White.

Protoconch flesh-coloured, translucent, glossy, smooth, consisting of about 2 ¼ whorls, suture indistinct. Final part (¼ whorl) with 4 or 5 strongly convex fine axial riblets, reaching from suture to suture, interspaces wide. Transition to teleoconch indistinct. Diameter: 0.9 mm.

Axial ribs prominent, broad, traversing from suture to suture on all whorls. 7-9 ribs on upper whorls, 9 or 10 on body whorl. Interspaces rather broad, deeply impressed, as broad as ribs. Axial growth lines well-visible in axial interspaces.

Teleoconch beginning with 3 primary spiral cords, additional cord appearing on second whorl together with 1 fine intercalated secondary cord between primary cords. From third or fourth postnuclear whorl on, fine, sharp intercalated tertiary cords appear; their number increasing to up to 7 on body whorl. Spiral cords stronger when crossing axial ribs.

Aperture ovate, pinched at both ends, white. Outer lip crenulated, with some short close-set lirae within, stronger near siphonal canal. Inner lip curved, callus thin, appressed to parietal wall, surface smooth, without columellar folds, with small callused tooth near posterior canal.

Siphonal canal short, strongly curved, broad; outer side ornamented with some spiral cords and intercalated threads which become weaker towards tip of siphonal canal.

Periostracum thin, greenish.

Operculum reddish-brown, corneous, shape and size corresponding to aperture, rounded above, pointed below, nucleus terminal.

Radula (Fig. 34) typical of genus. Central tooth tricuspid, nearly rectangular, top slightly narrower than base, cusps of similar size. Lateral teeth relatively short, base broad, with 4-6 pointed cusps with slightly incurved tips. Outermost cusp conspicuously strong, broad, long, middle cusps smallest, 2 inner cusps again stronger. Inner end with small denticle, occasionally also at outer end.

Range and habitat. Known from the western South Pacific, from Fiji, Vanuatu, New Caledonia and southern Coral Sea. Live collected specimens 397-797 m deep, empty shells 386-843 m deep.

Comparison. *Fusinus retarius* (von Martens, 1901) can be separated by the remarkable differences in protoconch morphology (white, only 1-1 ¼ whorls), the somewhat larger adult size (to 56.7 mm), the smaller number of whorls (about 10), the broader and rounded spiral cords, and by differences in radular morphology.

Pseudolatirus pallidus Kuroda and Habe in Habe, 1961 and *F. virginiae* Hadorn and Fraussen, 2002 differ by the somewhat larger adult size, the longer spire, the more constricted suture, the more pronounced axial ribs, and the longer, almost straight siphonal canal. *P. pallidus* differs also by the reddish brown to dark brown protoconch, consisting of 2 ½-2 ¾ whorls, and *F. virginiae* by a whitish protoconch, consisting of 1 ¾ whorls.

Etymology. *Fusinus alcyoneum* sp. nov. is named after *alcyoneum* (Latin, neuter) and used in *alcyoneum*

medicamen which is "sea-foam", which refers to the white colour.

***Fusinus (Chryseofusus) thermariensis* sp. nov.**

Figs 19-22, 35

Type material. Holotype MNHN Moll 9410 (54.7 x 22.4 mm, dd).

Paratype 1, MNHN Moll 9411 (26.9 x 12.4 mm, lv juv). – Paratype 2, RH (29.0 x 12.3 mm, dd subad).

Type locality. Volcans Hunter and Matthew, VOLSMAR stn DW7, 22°26' S, 171°44' E, 325-400 m.

Material examined. Volcans Hunter and Matthew, VOLSMAR stn DW7, 22°26' S, 171°44' E, 325-400 m, 1 dd (holotype).

Loyalty Ridge, MUSORSTOM 6 stn DW428, 20°24' S, 166°13' E, 420 m, 1 lv juv (paratype MNHN); stn DW478, 21°09' S, 167°54' E, 400 m, 1 dd subad (paratype RH).

Description. Shell relatively small (up to 54.7 mm), fusiform, solid. Spire broad, consisting of about 9 strongly convex whorls, quickly increasing in diameter. Suture distinct, constricted, with a subsutural concavity. Axial growth lines well-visible and prominent when crossing the spiral sculpture, giving the surface the texture of linen. Colour uniformly light brown, aperture white.

Protoconch typical of genus, white, glossy, bulbous, consisting of about 1 ¼ convex whorls. Final part (about ¼ whorl) ornamented with 4 fine, inconspicuous axial riblets, traversing from suture to suture. Diameter: 1.0 mm.

All whorls sculptured with 8 or 9 strong, broad, prominent axial ribs, traversing from suture to suture, abapically more prominent. Interspaces broad.

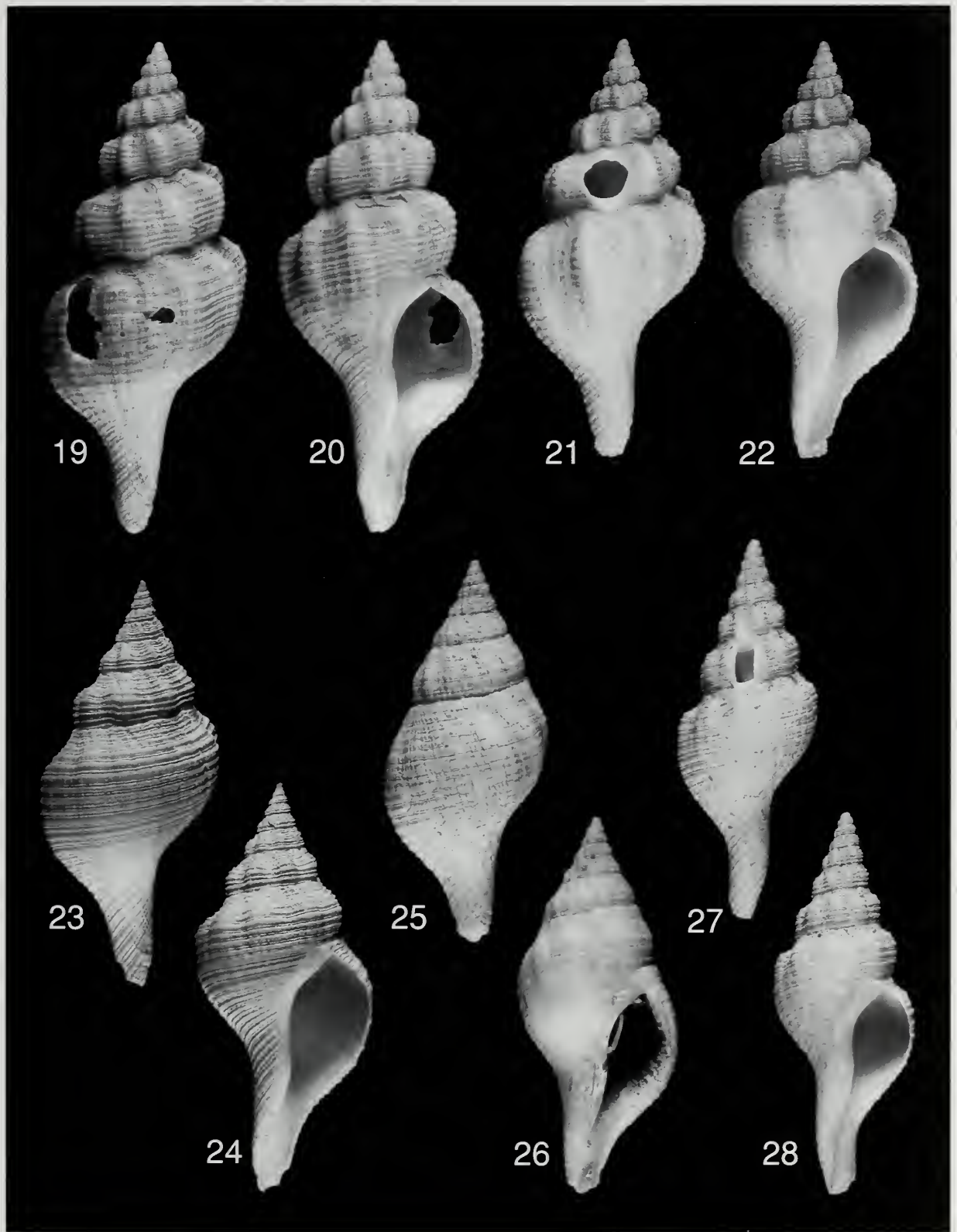
Teleoconch beginning with 4 primary spiral cords. 5 primary cords and an additional intercalated fine secondary spiral cord from second teleoconch whorl onwards. From fifth whorl onwards, up to 6 fine tertiary spiral cords of unequal strength between primary and secondary cords.

Figures 19-28

19-22. *Fusinus (Chryseofusus) thermariensis* sp. nov.

19-20. Holotype MNHN Moll 9410, Volcans Hunter and Matthew, VOLSMAR stn DW7, 54.7 mm;

21-22. Paratype 1 MNHN Moll 9411, Loyalty Ridge, MUSORSTOM 6 stn DW428, 26.9 mm; **23-24. *Fusinus (Chryseofusus)* species 1**, Southwest Pacific, Field Bank, MUSORSTOM 7 stn DW589, 47.6 mm; **25-26. *Fusinus (Chryseofusus)* species 2**, Loyalty Ridge, VOLSMAR stn DW43, 26.8 mm; **27-28. *Fusinus (Chryseofusus)* species 3**, Indonesia, Kai Islands, KARUBAR stn DW14, 27.6 mm.



Aperture ovate, whitish, pinched at both ends. Outer lip thin, curved, finely crenulated, with fine, close-set lirae within. Parietal callus thin, smooth, without columellar folds, some spiral cords of preceding whorl still visible.

Siphonal canal almost straight, slightly curved, as long as aperture. Outer side ornamented with close-set spiral cords and threads of unequal strength.

Operculum typical of genus, reddish-brown, corneous, ovate, rounded above and pointed below. Shape and size corresponding to aperture. Nucleus terminal. Outer side with fine concentric growth lines.

Radula (Fig. 35) typical of genus. Central tooth tricuspid, elongate, base slightly broader than top, both sides slightly concave. Middle cusp slender, pointed. Both outer cusps, beginning at top margin, extremely long, curved, pointed, with slightly incurved tips. Lateral teeth curved, base broad, with 6 or 7 long pointed cusps, outermost strongest. Small denticle at inner end.

Range and habitat. Only known from the type locality and from the Loyalty Ridge. One live collected specimen 420 m deep, empty shells 325-400 m deep.

Comparison. *Fusinus* (*C.*) *thermariensis* belongs to the subgenus *Chryseofusus* Hadorn and Fraussen, 2003, because of the weak, close-set spiral sculpture crossed by the strong close-set axial growth lines, the simple outer lip, and the completely smooth, not detached adherent parietal callus.

Fusinus (*C.*) *riscus* Hadorn and Fraussen, 2003 slightly resembles juvenile specimens of *F.* (*C.*) *thermariensis*, but differs by the clearly smaller adult size (up to 21.5 mm), the less convex whorls, the less constricted suture, the weaker and less numerous axial ribs, the different protoconch morphology (only one whorl, diameter 0.6-0.8 mm) and in the radula morphology (central tooth larger and more elongate; lateral teeth with 4-6 subequal cusps).

Fusinus (*C.*) *artutus* Hadorn and Fraussen, 2003 differs by the larger adult size (up to 72.2 mm), the more slender spire, the weaker and more numerous

axial ribs on upper teleoconch whorls, the absence of axial ribs on later whorls, the less constricted suture, and the shorter siphonal canal.

Etymology. *Fusinus* (*C.*) *thermariensis* sp. nov. is named after *thermarum* (Latin, feminine), a hot bath, well known from Roman times as *thermae* (plural), with the locative suffix *-iensis*, which refers to the type locality close to the volcan (but not to the habitat). This name conjures the contrast between hot (the volcan) and the surrounding cold ocean (the habitat).

Fusinus (*Chryseofusus*) species 1

Figs 23-24

Material examined. Southwest Pacific, Field Bank, MUSORSTOM 7 stn DW589, 12°16' S, 174°41' W, 400 m, 1 dd (47.6 x 20.7 mm).

Remarks. This remarkable *Fusinus* species, belonging to *Chryseofusus*, is characterized by the conspicuously broad, short spire and the inflated body whorl.

Fusinus (*C.*) *riscus* Hadorn and Fraussen, 2003 is similar in shape and sculpture, but differs by the smaller size (up to 21.5 mm), the more slender shape, the less inflated body whorl and the weaker spiral sculpture with broader interspaces and a higher number of secondary spiral cords.

Fusinus (*C.*) *artutus* Hadorn and Fraussen, 2003 is similar in shape and sculpture in juvenile specimens, but differs by the sharper primary spiral cords in combination with weaker secondary spiral cords and by the presence of numerous fine, sharp incremental lines.

Fusinus (*C.*) *thermariensis* sp. nov. differs by the more slender shell, the less inflated body whorl, the more constricted suture, and the more pronounced axial ribs.

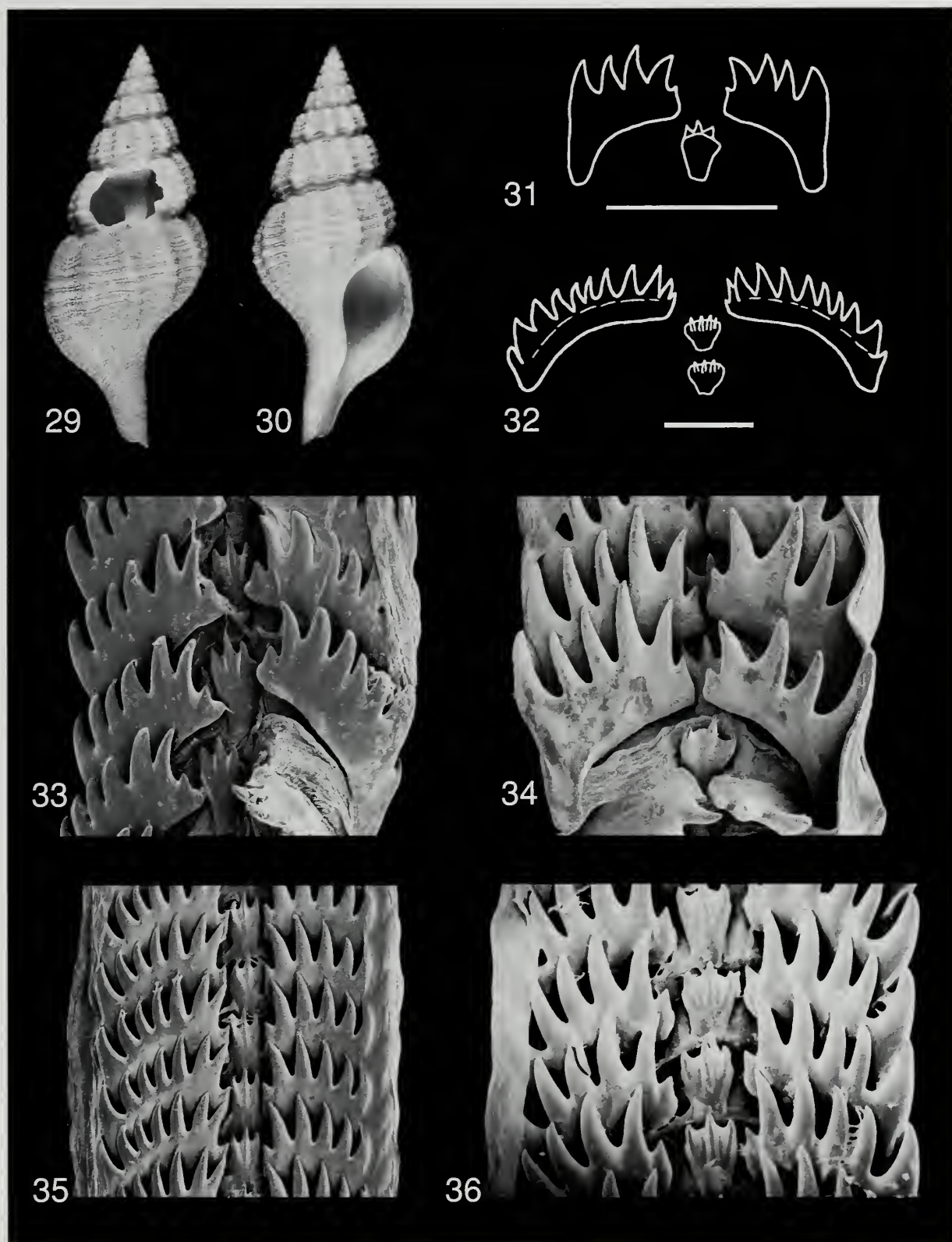
Because of the few material available (one dead collected specimen), a comparative study is beyond the possibilities, and the species is not described.

Figures 29-36

29-30. *Fusinus* species 4, Philippine Islands, MUSORSTOM 2 stn CP15, 34.2 mm.

Radulae.

31. *Fusinus inglorius* sp. nov., TAIWAN 2001 stn CP71, 31.2 mm (scale bar 100 µm); 32. *Fusinus flavicomus* sp. nov., TAIWAN 2001 stn CP79, 67.9 mm (subadult specimen) (scale bar 100 µm); 33. *Fusinus wallacei* sp. nov., KARUBAR stn CP69, 22.3 mm; 34. *Fusinus alcyoneum* sp. nov., BATHUS 3 stn DW784, 38.1 mm; 35. *Fusinus* (*Chryseofusus*) *thermariensis* sp. nov., Paratype 1 MNHN Moll 9411, MUSORSTOM 6 stn DW428, 26.9 mm (juvenile specimen); 36. *Fusinus* (*Chryseofusus*) species 3, KARUBAR stn DW14, 27.6 mm (juvenile specimen).



Fusinus (Chryseofusus) species 2

Figs 25-26

Material examined. Loyalty Ridge, VOLSMAR stn DW43, 22°12' S, 168°38' E, 480-540 m, 1 dd (26.8 x 11.6 mm).

Remarks. This small *Fusinus* species, belonging to *Chryseofusus*, is characterized by the conspicuously solid shell, the indistinct unrestricted suture and the close-set weak axial sculpture.

Fusinus (C.) alisae Hadorn and Fraussen, 2003 is much similar in sculpture, shape and size, but differs by the thinner shell, the more constricted suture, the stronger subsutural concavity, the convex whorls, the rounder base and by the curved siphonal canal.

Because of the few material available (one dead collected specimen) a comparative study is beyond the possibilities, and the species is not described.

Fusinus (Chryseofusus) species 3

Figs 27-28, 36

Material examined. Indonesia, Kai Islands, KARUBAR stn DW14, 05°18' S, 132°38' E, 245-246 m, 1 lv juv (27.6 x 10.3 mm).

Remarks. This *Fusinus* species, also belonging to *Chryseofusus*, is characterized by the slender shape, the strong broad axial ribs, and the shouldered whorls. The radula (Fig. 36) with the small number of cusps on lateral teeth and the tricuspid central tooth with strong cusps is typical of *Chryseofusus*.

Fusinus (C.) riscus Hadorn and Fraussen, 2003 is similar in size and sculpture but differs by the finer spiral sculpture, the broader shape with shorter spire, the less constricted suture, and the shorter straight siphonal canal.

Fusinus (C.) thermariensis sp. nov. differs by the larger shell, the more convex whorls and the more pronounced, broader axial ribs.

Because of the few material available (one juvenile specimen), a comparative study is beyond the possibilities, and the species is not described.

Fusinus species 4

Figs 29-30

Material examined. Philippine Islands, MUSORSTOM 2 stn CP15, 13°55' N, 120°29' E, 326-330 m, 1 lv (34.2 x 13.9 mm).

Remarks. This small *Fusinus* species is characterized by the uniformly white shell, the conspicuously constricted suture, the strong, close-set axial ribs and the short, strongly curved siphonal canal.

Fusinus alcyoneum sp. nov. is similar in colour, shape and size but differs by the flesh-coloured protoconch, the wider spaced axial ribs, the less constricted suture and the more prominent spiral sculpture.

Because of the few material available (one live collected specimen), a comparative study is beyond the possibilities, and the species is not described.

ACKNOWLEDGMENTS

We thank P. Bouchet, V. Héros and P. Lozouet (all MNHN). The realization of this paper was only possible due to their very kind and esteemed help and the loan of type material and large lots of comparison material. We thank also A. Warén (SMNH) for preparing radulae and taking the SEM pictures and David Monsecour (Belgium) for correcting the English text.

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